ADVANCED METHODOLOGIES FOR THE DENDROGEOMORPHIC ANALYSIS OF PAST FLOODS AND RELATED RISKS

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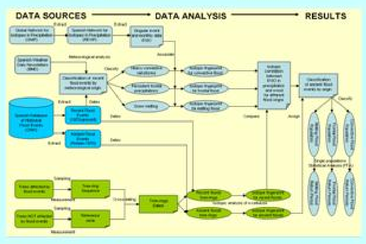
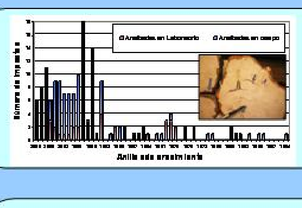
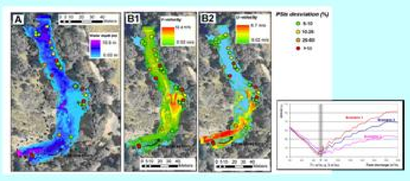
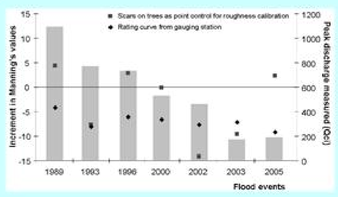
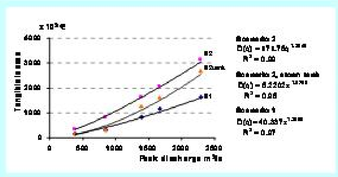
Dendrogeomorphology is a relatively young scientific discipline which uses information sources recorded in the roots, trunks and branches of trees and bushes located in the fluvial system to complement (or sometimes even replace) systematic and palaeohydrological records of past floods. The application of dendrogeomorphic data sources and methods to palaeoflood analysis over nearly forty years has allowed improvements to be made in frequency and magnitude estimations of past floods. Nevertheless, research carried out so far has shown that the dendrogeomorphic indicators traditionally used (mainly scar evidence) and their use to infer frequency and magnitude has been restricted to a small, limited character and application set, and that new possibilities with enormous potential remain unexplored.

PALAEOFLOOD STUDIES	CLASSICAL METHODS	ADVANCED DENDROGEOMORPHIC METHODOLOGIES AND OUR RESULTS
Origin of palaeofloods and their causes	- Ancient meteorological bulletins - Sedimentological studies - Paleoenvironmental analysis - Pollen and other fossils	 Application of isotopic indicators ($^{16}O/^{18}O$ fraction) in tree-ring alpha-cellulose to discover the meteorological origin of past floods
Dating palaeofloods	- Radiocarbon, luminescence - Cosmogenic isotopes - Archaeological elements....	 Use 3D anatomical analysis to understand the anatomical response of plant species and so improve sampling efficacy
Quantifying palaeoflood parameters – **Palaeoflood peak flow**	- Empirical equations - 1D hydraulic models - Palaeocompetence analysis	 Use different dendrogeomorphic indicators to estimate peak flows with 2D (and 3D) hydraulic models and study how they relate to other palaeostate indicators
Quantifying palaeoflood parameters – **Palaeoflood Roughness**	- Ancient landuse studies - Manning's n values tables - Rating curve calibration	 Investigate improved calibration of two dimensional hydraulic model parameters (roughness), using dendro-evidence for its spatial distribution patterns.
Palaeoflood related Risk Analysis	- Qualitative hazard analysis - FFA using only systematic data	 Apply statistic-based cost-benefit analysis to select optimal mitigation measures, including palaeoflood data and their related uncertainties.

The research projects Dendro-Avenidas (www.dendro-avenidas.es), MAS Dendro-Avenidas (Spanish Ministery of Science and Innovation), and IDEA-GesPPNN (Spanish Ministery of Environment; www.idea-gesppnn.es), are exploring these promising directions. In their web pages you can find an overview of their first results and innovate methodologies, focused in their possibilities and limitations for the reconstruction of recent floods and paleofloods over the World.

Where are we applying these advanced methodologies ?

- EL SALVADOR
- NORTHERN ENGLAND
- SWISS ALPS
- SPAIN

SPAIN:
· Venero Claro
· Navaluenga
· Galayos
· Arenas de San Pedro
· Segovia
· Monfragüe National Park
· Caldera de Taburiente N.P.

If you are interested in collaborating with us on these innovative research projects, please contact us.